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STEGOPHIURA PONDEROSA (LYMAN), NEW COMBINATION, AND *AMPHIOPHIURA VEMAE* AND *HOMOPHIURA NEXILA*, NEW SPECIES (ECHINODERMATA: OPHIUROIDEA) FROM THE R/V *VEMA* COLLECTIONS

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Abstract.—*Amphiophiura ponderosa* Matsumoto is placed in the ophiurid genus *Stegophiura* and is redescribed. The geographic distribution of this species is extended to the Southern Hemisphere. *Amphiophiura vemae* and *Homophiura nexila* collected from the R/V *Vema* off the west coast of Central and South America are described as new species.

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Between November 1958 and March 1961, benthic samples were collected from the R/V *Vema* of the Lamont-Dougherty Geological Observatory of Columbia University along the west coast of Central and South America between the latitudes of 13°N and 47°S. This sampling was a part of a long-term benthic exploration using the *Vema*. The collected echinoderm specimens were deposited in the American Museum of Natural History.

Among the specimens that were previously unidentified, two were new species. Also within these collections were three specimens of *Amphiophiura ponderosa* (Lyman), which after comparison with the descriptions by Lyman (1882) and Clark (1911), is assigned to the genus *Stegophiura*.

Order Ophiurida Muller & Troschel, 1840
Ophiuridae Lyman, 1865
Stegophiura ponderosa (Lyman),
new combination
Fig. 1

Ophioglypha ponderosa Lyman, 1878:93, pl. 2, figs. 52–54.
Ophiura ponderosa.—Meissner, 1901: 925.—H. L. Clark, 1911:77.
Amphiophiura ponderosa.—Matsumoto, 1917:261.

Material examined.—R/V *Vema* samples: V-17-15, Golfo de Penas, Chile, 47°02′S, 75°36′W, 642 m, 24 Mar 1961, 3 individuals, 1 specimen deposited as paratype in American Museum of Natural History (AMNH 2758).

Description.—Disc diameter 32 mm, arms incomplete, length estimated at 100 mm.

Disc about 10 mm high, covered by about 130 irregular, angular, thick plates. Primary plates conspicuous, separating proximal ends of radial shields, high, prominent, forming low projections. Radial shields large, nearly as wide as long, contiguous distally along straight inner margin, widely separated proximally by primary plate. Radial shields and primary plates locked together with "dove-tail" notch arrangement at distal apices of primary plates.

Ventral interbrachial spaces covered by 9 to 13 plates. Plates immediately distal to oral shields irregularly elongate, remaining plates irregular, angular, similar to aboral disc plates.

Oral plates narrow, conspicuously swollen at proximal end forming a marked elevation on face of each jaw, tapering to points distally adjacent to adoral plates. Apical papillae 2, bluntly pointed. Oral papillae 4 to 7 on each side of jaw, varying from small, low, and truncate to large and elongate, distinct but continuous with oral tentacle pore papillae. Oral tentacle pores large, opening

Fig. 1. *Stegophiura ponderosa.* Dorsal view (top), lateral view (center), and ventral view (bottom).

partially into mouth slit, protected by 6 large oral papillae proximally and by 6 smaller papillae borne by peristomal plate distally.

Oral shields small, arrow-shaped, with distal rounded semicircular distal lobe between the genital slits. Adoral shields relatively large, rectangular, with projections at outer distal ends separating oral shields from first lateral arm plates. Each adoral shield bearing 3 to 4 papillae on distal outer corners similar to opposing genital papillae. Adoral shields unequal in length, one usually slightly longer, overriding other.

Genital slits long and narrow, continuing nearly halfway to aboral side of arms. Each slit bordered by 3 to 4 plates; small round plate adjoins oral shield, followed by long, rectangular plate continuing to aboral arm base where it fragments into 2 to 4 increasingly smaller angular plates meeting at arm aboral apex distal to radial shields. Each plate bearing series of low, rectangular, wider proximally, narrower distally, marginal papillae continuing aborally to arm apex forming arm comb.

Arms higher than wide, triangular in cross-section. Dorsal arm plates much wider than long, rectangular, becoming pentagonal and nearly equal, or slightly longer than wide, near arm tip. Dorsal arm plates appearing folded over apex of arm, broadly in contact throughout. First ventral arm plate pentagonal, wider than long, adjoining next plate. Succeeding arm plates trapezoidal to pentagonal to diamond-shaped, wider than long in distal parts of arm.

Lateral arm plates high, narrow, pointed at both ends and interlocking with oral and aboral plates, distal sides convex, proximal sides concave. First lateral arm plate bearing 16 arm spines, succeeding plates carrying approximately 10 spines. Arm spines dimorphic, 3 on proximal plate, 2 on succeeding plates, rounded, bead-like, becoming bluntly pointed distally. Second type low, truncate, first immediately above tentacle scales which are similar but disappear distally. Lowest rounded spine separated from tentacle scales by 1 truncate spine, those above separated by 4 to 5 spines.

Tentacle pores large, protected by as many as 8 tentacle scales on each side with outer set overlapping partially, or entirely hiding inner set. After third or fourth arm joint no distal tentacle scales, after sixth or seventh joint only 2 or 3 tentacle scales persisting with pores to arm tip.

Color (dried from alcohol): whitish tinged with light brown.

Distribution.—Western Pacific off Japan, Okhotsk Sea, eastern Pacific off Alaska, central California, and Chile; outer continental shelf to middle slope, 137 to 923 m. Previous to the collection from the R/V *Vema, Stegophiura* was known only from the Northern Hemisphere (D'yakonov 1954, Downey 1969). This collection extends the range of both genus and species to the Southern Hemisphere from the boreal North Pacific. The bathymetric distribution of the species is maintained.

Discussion.—This species has not been described in detail since Lyman (1882), who had only one specimen with which to work. Also, Lyman's description and figures were detailed and accurate in regards to disc features, but were not correct in depicting the arm spines, as was noted by H. L. Clark (1911). Because of this situation and the suggested transference of the species to another genus, the above detailed description is presented of the most complete and typical of the three specimens collected.

The genera *Amphiophiura* and *Stegophiura* were erected by Matsumoto (1915, 1917) while clarifying species relations within the genus *Ophiura.* The two genera were distinguished by Matsumoto on the basis of only the dimorphism of the arm spines and the relation between arm height and width. All other characters of the two genera were similar according to Matsumoto's discussion. However, the two genera differ also by the apparent degree of stoutness and inflation of the aboral disc scales with *Stegophiura* being the stouter.

Matsumoto (1917) listed *Ophioglypha ponderosa* as an *Amphiophiura* in his Group III containing species with the oral interradial disc covered with small plates, with quadrangular oral arm plates, and uniform arm spines. According to Lyman's (1878, 1882) description and figures, this was a correct generic placement even though Lyman described the oral arm plates as "broadly hexgonal." However, the *Vema* specimens and two individuals from *Albatross* station 5023 in the Okhotsk Sea were definitely *Stegophiura* while also fitting Lyman's description of *O. ponderosa* reasonably well. All specimens had a high and stout disc, higher than wide arms, and dimorphic arm spines. It is because of these characters that *O. ponderosa* is transferred here to *Stegophiura.* Matsumoto (1917:262) indicated that Group III, which contained *O. ponderosa,* approaches *Stegophiura.*

Amphiophiura vemae, new species
Fig. 2

Material examined.—R/V *Vema* samples: V-17-1, southeast of Punta Aguja, Peru, 7°10′S, 85°50′W, 4124 m, 26 Feb 1961, 1 individual; V-17-5, off Punta Morquilla, Chile, 38°15′S, 76°00′W, 3739 m, 15 Mar 1961, 7 individuals, holotype (AMNH 2759), 6 paratypes (AMNH 2760).

Etymology.—The specific name was chosen in honor of the R/V *Vema.*

Description.—Disc diameter 9 mm; arm length approximately 12 to 14 mm.

Disc stout, slightly convex, nearly 4 mm high. Dorsal side of disc covered by about 84 plates. Primaries and radial shield conspicuous, slightly swollen. Radial shields slightly longer than wide, with rounded outer edges and straight inner edges for distal two-thirds of their length; in contact for distal one-third, separated proximally by small, wedge-shaped plates and larger, rounded, slightly swollen plates.

Ventral interbrachial spaces covered by large oral shields and 14 to 16 small, irregular marginal and submarginal plates.

Oral papillae stoutly triangular, well separated, 3 to 5 on each side of jaw, 2 to 3 longer apical papillae.

Oral tentacle pores large, opening entirely outside mouth slit, protected by 1 long, low, flat scale on each side of pore.

Oral shields nearly oval with narrowed proximal end, lateral sides partially covering genital slits, separated from first oral arm plates by adoral shields. Adoral shields short, rectangular, broadly in contact.

Genital slits long, partially obscured distally by arm comb papillae. Each slit bordered by 2 plates, most ventral small, inconspicuous, carrying 2 or 3 wide, flat, adjoining truncate papillae. Second plate large, conspicuous from lateral view, carrying marginal series of 7 to 9 wide, flat papillae with rounded tips.

Arms stout, slightly rounded, bluntly triangular in cross-section proximally. First dorsal arm plate broadly triangular with convex distal edges. Subsequent dorsal arm plates tetragonal with convex distal margins and flaring sides, becoming pentagonal near middle of arms, triangular near tips, broadly in contact proximally but widely separated near arm tips.

First ventral arm plate hexagonal, wider than long, distal margin longer than proximal. Succeeding plates tetragonal, as long as wide with convex ends and concave sides, becoming more rounded and smaller distally with most distal nearly circular, broadly in contact until seventh to ninth joint, after which plates rapidly separate.

Lateral arm plates approximately as wide as high, rounded, meeting above and below only in distal part of arm. Each plate carrying 2 to 3 equally spaced, small, terete spines.

Tentacle pores large and protected by 2 long, low, flat scales. Distal scales often inconspicuous; tentacle pores and scales persist to arm tip. Color (dried from alcohol): ivory white.

Distribution.—Southeast Pacific upper abyssal regions off Peru and Chile, 3739 to 4124 m.

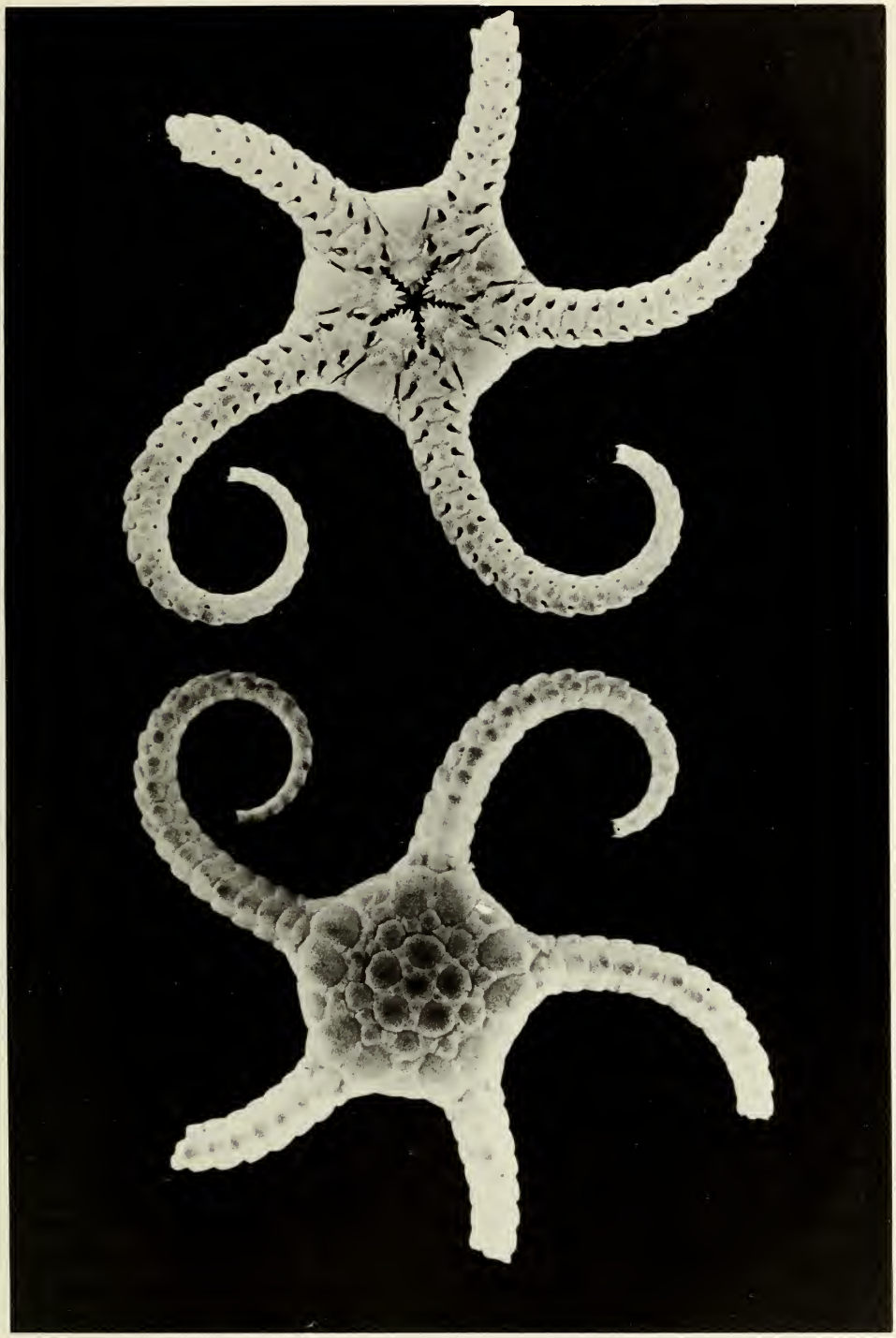

Fig. 2. *Amphiophiura vemae.* Ventral view (top) and dorsal view (bottom).

Discussion.—While these specimens definitely belong to the genus *Amphiophiura,* they are distinct from all other species presently in the genus. Distinctive features include the relation of the radial shields, the shape and number of the oral and genital papillae, and the number and appearance of the tentacle scales. Litvinova (1971) listed two other *Amphiophiura* species in the general region from which *A. vemae* was collected. These two, *A. undata* (Lyman) and *A. convexa* (Lyman), as described by Lyman (1878, 1882) differ from *A. vemae* in having more tentacle scales on each pore, and the arm comb papillae are pointed rather than flat and truncate. Also, the oral papillae are rectangular and truncate in *A. undata* rather than triangular and pointed as in *A. vemae.* The oral shield of *A. undata* is relatively much smaller than in *A. vemae.*

Litvinova (1971) also described a new subspecies from the Northwest Pacific, *Amphiophiura bullata* (Thompson) *pacifica* Litvinova, that was collected within the same abyssal depth range as *A. vemae.* However, in addition to the substantial geographical separation, the species differ in that *A. bullata pacifica* has six to eight tentacle scales where *A. vemae* has only one to two. Also, specimens of *A. bullata pacifica* collected from the same depths as *A. vemae* possessed relatively more dorsal disc scales than *A. vemae* between the primary plates.

The relatively large number of specimens and the variety of sizes present in the two samples from abyssal depths suggest that this zone is the normal habitat for the species.

Homophiura nexila, new species
Fig. 3

Material examined.—R/V *Vema* samples: V-15-37, Gulf of Panama, 7°25′N, 79°23′W, 1749 m, 14 Nov 1958, 3 individuals, holotype (AMNH 2761), 2 paratypes (AMNH 2762); V-15-42, off Costa Rica, 7°55′N, 86°00′W, 3087 m, 19 Nov 1958, 1 individual; V-15-58, off Costa Rica, 12°11′N, 89°34′W, 5690 m, 27 Nov 1958, 2 individuals.

Etymology.—From *nexila* (Latin), meaning tied together, referring to the tapering, jointed appearance of the arms.

Description.—Disc diameter 7 mm, arm length about 12 mm.

Disc stout, flat; dorsal side covered by approximately 90 plates. Primary plates conspicuous, convex. Radial shields conspicuous, flat, twice as long as wide, nearly oval, touching at a point one quarter of length from distal ends, diverging from this point. Radial shields separated distally by small, triangular plate in contact with first dorsal arm plates; proximally separated by 2 plates, more distal longer than wide and acutely triangular, second nearly tetragonal. Each radial shield bearing 2 minute, terete, opaque spines on most lateral interradial margins.

Oral plates of jaw nearly trapezoidal with extended proximal corners, each plate bearing 4 low, fused truncate oral papillae. Single, bluntly pointed apical papilla.

Oral shields small, with proximal angle, rounded distally, well separated from first ventral arm plates by adoral shields. Adoral shields large, narrower at proximal end, broadly in contact. Each plate bearing 1 large, opercular papilla protecting second oral tentacle pore.

Genital slits short, inconspicuous, guarded by 1 to 3 small, bead-like papillae. Each slit bordered by 2 plates, bar-shaped with rounded ends, distal plate approximately twice as long as proximal. Proximal plates bearing genital papillae, distal plates bare. No arm comb.

Arms rounded in cross-section, rapidly tapering, slender. First dorsal arm plate broad, wider than long, semicircular with straight proximal border adjoining disc plate separating radial shields distally. Dorsal arm plates after first small, inconspicuous, tetragonal, wider proximally, longer than wide, becoming equilateral distally, widely separated throughout.

First ventral arm plate rounded, approx-

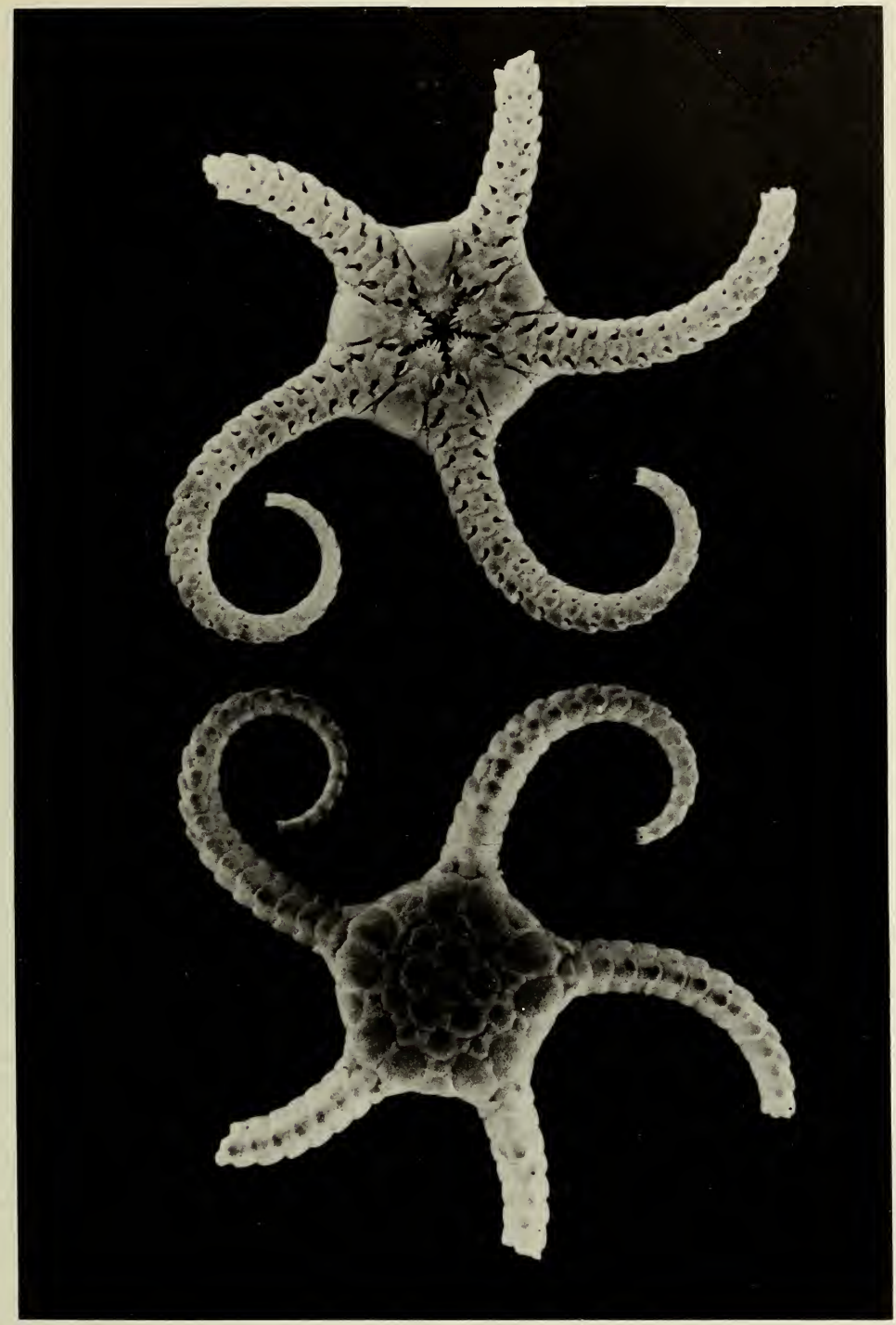

Fig. 3. *Homophiura nexila.* Ventral view (top) and dorsal view (bottom).

imately hexagonal, bearing 2 low, flat papillae pointed at inner ends and projecting into mouth slit giving plate notched appearance. Succeeding ventral arm plates triangular with concave sides, rapidly diminishing after fifth joint, absent after ninth, widely separated throughout.

Lateral arm plates wider than high, broadly in contact after first joint; each plate carrying 3 to 4 small, evenly spaced terete, translucent spines.

Oral tentacle pores small, inconspicuous, opening partly into mouth space, obscured by adoral papillae. Arm tentacle pores larger, protected by 2 low rounded scales on first pores only. After second joint only larger outer scales remain. Tentacle pores present only to fourth joint.

Color (dried from alcohol): ivory white.

Distribution.—Lower continental slope and abyssal regions of the Gulf of Panama and the eastern Pacific off Central America, 1749 to 5690 m.

Discussion.—Hubert Lyman Clark (1915) established this genus with *Ophioglypha inornata* Lyman as the type and included 19 species. Paterson (1985) revised *Homalophiura* and confirmed that the generic name is invalid. Paterson proceeded to place the species formerly assigned to *Homalophiura* into four groups; one of which was the new genus *Homophiura.* The above described specimen corresponds well with Clark's generic description and with generic characters in Lyman's (1878, 1882) description of *O. inornata.* The distinguishing specific characters including the restriction of the tentacle pores to the proximal four arm joints, the long genital slits, and the poorly developed arm combs place this species in Paterson's Group D or the new genus *Homophiura.* The small spines on some disc scales are unusual and differentiate *H. nexila* from other *Homophiura* species.

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